

tures were not used, so as to avoid stirring up possible opposition to the whole effort, and before the fact such a decision may have been a reasonable one. In retrospect, it seems that the program could have proceeded in a less gingerly way.

One could speculate endlessly about what might have been done, and what the effects might have been. It is the great merit of *Family Planning in Taiwan* that it concentrates on telling in great detail what actually was done, and as far as technically possible what the actual effects were. At least one basis for optimism about the future of population control is the fact that scientific competence of such a high order is being used to monitor and evaluate pioneering efforts in the field. The successes and failures of the Taichung program are presented for all to see and reflect on. Similar studies in other countries, which the authors deem essential, should sharpen our understanding of both the capabilities and the limits of the current family-planning approach.

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Molecular Embryology

Gene Activity in Early Development. ERIC H. DAVIDSON. Academic Press, New York, 1969. xii + 376 pp., illus. \$12.50.

The concept of the gene has come a long way since Mendel. Originally genes were factors whose distribution was governed by unknown agents. These agents were soon found to be the chromosomes. The physical identity of the gene remained unknown until the role of DNA was discovered. With that, genes became nucleotide sequences that could be translated into the particular amino acid sequence of a given protein. It would certainly seem that we have finally reached the end of at least one path Mendel started us on, and that the gene has been identified.

If genes are nucleotide sequences that give rise to particular proteins, then strictly speaking this book does not say much about gene activity. In fact, with the exception of a few "genes" governing the production of nucleolar RNA, no bona fide genes are mentioned. The problem is that the title is ahead of its time. A more accurate title would have been "Ribonucleic Acids in Early Development." There is a lot here on that

subject. In fact, the abbreviations RNA and DNA appear on about three-quarters of the pages. Essentially this is a review of the abundant literature that has now accumulated on the characteristics and changes in RNA during early development of molluscan, echinoderm, and amphibian embryos. This is an area in which Davidson has made important contributions.

In a way this book reviews the beginnings of attempts by embryologists to examine development from the inside out. In the past most of molecular biology has been directed toward determining the chemical basis for a particular phenotype. The approach here is the reverse. The nucleic acid changes that occur during development are becoming known; the question is now, What phenotypic character do they control?

The "early development" of the title in general refers to development through gastrulation. The nucleic acid changes that occur during this period are placed in proper perspective with good summaries of the pertinent areas of experimental embryology. There is also a large section on oogenesis, a part of embryology that is often ignored yet obviously important if the developmental process is to be understood.

This book is the first major attempt to bring the results of experimental embryology and molecular biology together in a coherent whole. It will be indispensable to anyone who wishes to know what has been going on in the early development of molecular embryology.

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Natural Communities

Habitats and Territories. A Study of the Use of Space by Animals. PETER H. KLOPFER. Basic Books, New York, 1969. x + 118 pp., illus. \$3.95. Basic Topics in Comparative Psychology.

Elton once stated that "while ecological work is fascinating to do, it is unbearably dull to read about." He also warned against making ecology consist in "saying what every one knows in language that nobody can understand." After 40-odd years his statement is still true, but his warning has a quaint, old-fashioned ring about it; for although we know little more than we did in 1927 about the way communities are organized, we do have new and sophis-

ticated ways of saying the same old things. Such treatment, while giving the subject a spurious air of respectability, is particularly unfortunate in the present book, which, as one of a series on Basic Topics in Comparative Psychology, is supposed to appeal to students of psychology and the social sciences.

The author's intentions are laudable enough: he wants to stop those who write about human behavior from dressing up preconceived notions as justifiable inferences from the behavior of other animals. Although he would probably agree with Tinbergen [*Science* 160, 1411-18 (1968)] that it is the methods rather than the results of ethological studies that such writers should attend to, he himself dishes up a conceptual macedoine that is unlikely to be digestible by readers whose diet may not have included biology. Such readers will certainly see that ideas about animals' use of space are too varied to lead to satisfactory conclusions of any kind, but are unlikely to get much out of learning how ecologists measure bird species diversity—beyond noting that they seem unsure of the difference between prediction and correlation.

The prevailing lack of rigor in the study of natural communities is also apparent from other statements. Merely to "infer [from descriptive data] the explanation for the continued coexistence of related species" (p. 6) counts as a form of experimentation, and discussions of the competitive exclusion principle ignore the recognized difficulty that one is dealing either with a tautology or an unfalsifiable hypothesis. (It is not too surprising that this principle has led to less of a renaissance in ecology than was at one time predicted.) Miller's paper on competitive exclusion [*Adv. Ecol. Res.* 4 (1967)] is only one of the odder omissions from the references, few of which go beyond 1966.

Results with birds and mammals, before being extended to human beings, must "account for all relevant evolutionary and ecological factors" (p. 102). Strictly interpreted this advice amounts to an indefinite taboo on a comparative approach to human behavior, which is far from the author's intentions. More loosely interpreted, however, his advice might reduce the number of simplistic explanations of mental illness, crime, riots, and war (between nations and sexes) and free certain grant applications from their more dubious claims.

With the author's main theme one

cannot quarrel. Animals divide up their living space in patterns we must learn to recognize and quantify; we don't know how they do it or how this behavior has been selected; but we do know that its functions are too diverse and too poorly understood at present to explain the developmental history of our own behavior. Given the present selection of topics, which includes almost nothing on primates, the reader will therefore wonder where to find those theories of animal behavior that, in the optimistic prose of the editor, "are and will continue influencing present civilization in important ways."

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Solid State Technology

Physics of Semiconductor Devices. S. M. SZE. Interscience (Wiley), New York, 1969. xvi + 814 pp., illus. \$19.95.

Since its initial successful application in transistors some 20 years ago the semiconductor has played an increasingly important role in our technology. It is now the basis of the 30-odd individual devices described in this volume and the subject of an intensive research program which has helped make solid state physics a major area of study in laboratories throughout the world. The breadth and cost of such research have raised questions during the past several years about the need for further large-scale effort. The fruit of recent laboratory work (with one major omission) is explored in this volume, and the variety of possible devices that are described indicates a continuing basis for support of application work on semiconductors.

This book is long and fully packed; the characteristics of the devices, a simple understanding of their operation, and the state of the art today are all conveyed well in the text and the 500-odd illustrations. The author intended to provide a background that will enable the reader to follow the development of future devices with ease. In this he misses his mark, but that is easy to understand. There is not enough space in one volume to properly discuss semiconductor physics and still describe the variety of devices that are available today. The compromise the author has made is well balanced. As a result, the book should be both a highly useful reference to research scientists and

engineers in the solid state field and a valuable source book for students.

This book contains a number of minor errors, is uneven in its timeliness, and unduly favors the author's own institution in describing the contributions to the development of several devices. Sze occasionally makes reference to the importance of one device relative to another, but provides no facts to support his opinions; a systematic attempt to provide the reader with a comparative evaluation of the various devices would have been useful. The book makes no reference to a growing area of device research involving amorphous materials, particularly amorphous semiconductors. Although it is early to say that this research will have a practical impact on our technology, it does involve new devices and a little-understood area which could be important. Sze spends time on devices he admits (and we know) to be interesting but technologically of little importance; a new field should certainly have been worth as much space. These criticisms notwithstanding, I believe this book to be an important addition to the large body of literature in the field. For all its minor faults, it surpasses other attempts to provide a survey of semiconductor devices and a modicum of discussion of how they work.

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Inorganic Films

Physical Measurement and Analysis of Thin Films. Eastern Analytical Symposium, New York, 1967. E. M. MURT and W. G. GULDNER, Eds. Plenum, New York, 1969. xii + 196 pp., illus. \$12.50. Progress in Analytical Chemistry, vol. 2.

This volume contains eight papers on thin films. All the articles use the term "thin" without explicitly defining the range, which may be from a few angstroms up to 40,000. The first chapter describes the nondestructive optical techniques for the determination of the thickness of thin films. It starts with the fundamental optical principles necessary for understanding the methods described. It can be read with profit by nonspecialists who are curious to learn more about determining film thickness by simple optical means but who have a limited knowledge of optics. The major part of this

chapter (13 pp.) is devoted to the method of "variable angle monochromatic fringe observation" developed by the author, W. A. Pliskin. "Ellipsometry" is dealt with in five pages. It is to be regretted that no comparison is made between the methods described, and explicit mention of the smallest change in thickness detectable by the different techniques would have been of interest.

In the second article, Eugene P. Bertin reviews comprehensively the x-ray methods for investigating thin films and platings. X-ray methods can yield information on more properties of thin films than can optical methods, which are limited to thickness and index-of-refraction determination. However, the majority of the articles mentioned in the bibliography concern the evaluation of thickness. No figure is given as to the accuracy achieved in the measurement of thickness.

The x-ray fluorescence and electron microprobe techniques for determination of film thickness are treated by Jane E. Cline. The ultimate sensitivity is estimated to be ± 6 angstroms of aluminum.

The fourth article is more specialized. It describes the beta-backscattering technique for determining the density of sputtered tantalum films. The important use of electron microscopy and electron scattering for the characterization of film is thoroughly treated by R. B. Marcus. This paper discusses electron microscopy and electron diffraction for determining the texture of films, the crystal structure, and the defect structure of materials.

The sixth and seventh articles concern the analysis of films by spectrography and mass spectrography, respectively. The last article deals with chemical and structural analysis of glass films by infrared spectroscopy, interference in the visible range, and selective etching. Only metallic and glass films are discussed in this book, and biological organic films are not covered. It would thus have been more realistic to entitle the book "Physical Measurement and Analysis of Thin Inorganic Films."

In summary, this small book can serve as a good introduction to film techniques, mostly thickness determination, and the thorough bibliographies given at the end of each chapter will allow the reader to go more deeply into the subject if necessary.

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